Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of the Claims

1. (Currently Amended) A method for thermoforming a thin thermoplastic carrier with uniformity of thickness at optical quality comprising the steps of:

locating a heated sheet on a vented platform equipped with a mold insert that is adjustably disposed through an aperture and clamping the thermoformer's platens to clamp a shroud over the heated sheet onto the vented platform;

confining a low pressure air stream within a the shroud having a geometry matched to the mold's insert's periphery with the vents being located between the aperture and the shroud; and

deflecting the air stream from a path leading directly to the mold insert thereby thermoforming the sheet to produce a uniformly thick optical carrier.

2. (Original) The method of claim 1, further comprising the step of:

circulating a heating medium through circulating channels within the vented platform and through circulating channels within a sub-platform spaced from the vented platform to form a gap therebetween which communicates with the vents.

3. (Original) The method of claim 2, wherein the heating medium has a temperature in the range of 100 degrees F to 200 degrees F, and wherein the heating of the vented platform raises the air temperature in the vicinity of the mold insert to about 80 to 180 degrees F.

4. (Original) The method of claim 2, wherein the heating medium has a temperature in the range of 115 degrees F to 145 degrees F, and wherein the heating of the vented platform raises the air temperature in the vicinity of the mold insert to about 100 to 130 degrees F.

5. (Original) The method of claim 2, wherein said vented platform heats one side of the sheet and the air stream heats the other side of the sheet, wherein the air stream is about 100 to 130 degrees F.

6. (Original) The method of claim 2, wherein prior to said locating step, the method further comprises the steps of :

equipping an injection mold insert with a base member;

installing the base member through the vented platform and gap into a receiving port formed within the sub-platform;

adjusting the position of the mold insert to lie even with the vented platform surface; and

locking the base member into position within the receiving port.

7. (Original) The method of claim 2, further comprising the steps of:

circulating a cooling medium through channels within a support platform; and

sandwiching an insulating plate between the sub-platform and the support platform.

8. (Original) The method of claim 1, wherein prior to said locating step, the method comprises:

removing a protective film from the sheet;

fixturing the sheet within a sled; and

heating the sheet to at least its glass transition temperature.

9. (Original) The method of claim 8, wherein said removing, fixturing, heating and locating steps occur within a positive HEPA airflow environment.

10. (Original) The method of claim 9, wherein said heating step comprises:

IR heating the sheet for less than about 15 seconds at a rapid rate to reduce the time between said removing step and said locating step.

11. (Original) The method of claim 10, wherein said rapid heating comprises:

IR heating the sheet to a temperature between 80 and 250 degrees F by radiation at a wavelength tuned to the thermoplastic's absorption band.

12. (Original) The method of claim 1, wherein said locating step comprises:

providing a sheet between 0.01 and 0.10 inches thick that is heated to at least the glass transition temperature of the sheet.

13. (Original) The method of claim 1, wherein said clamping step comprises:

exerting between 22 and 300 psi similar clamping force onto each platen.

14. (Original) The method of claim 13, wherein said confining step includes:

pressurizing said shroud with a low pressure air stream comprising an air pressure less than about 90% of the clamping force.

15. (Original) The method of claim 1, wherein said confining step includes

pressurizing the shroud with a low pressure air stream less than about 290 psi.

16. (Original) The method of claim 1, wherein said clamping step comprises exerting between 70 and 85 psi similar clamping force onto each platen; and

said confining step comprises pressurizing the shroud with a 60 to 80 psi air stream.

17. (Original) The method of claim 1, wherein the shroud includes an open end facing the vented platform and having the same geometric shape as the mold insert's periphery.

18. (Original) The method of claim 1, wherein the shroud has at least one cross-sectional shape with the same geometric shape as the mold insert's periphery.

19. (Original) The method of claim 18, wherein the shroud has a uniform cross-sectional shape along its height.

20. (Original) The method of claim 17, wherein the mold insert's periphery is circular with radius r, and the shroud's open end is circular having a radius R, larger than r.

21. (Original) The method of claim 20, wherein the shroud is cylindrical.

22. (Original) The method of claim 21, wherein the shroud's cross-sectional area is less than two times larger than the area of the mold insert.

23. (Original) The method of claim 20, wherein the vented platform's vents are located at a radius V, in which $r < V < R$.

24. (Original) The method of claim 1, wherein said method comprises simultaneously thermoforming several carriers and further comprises the following steps:

locating a heated sheet on a vented platform equipped with multiple mold inserts;

providing one geometry-matching shroud for each mold insert; and

deflecting the air stream within each shroud.

25. (Original) The method of claim 1, wherein the air stream emanates from an open inlet located at the top of a cylindrical shroud and all paths leading from the inlet to the mold insert collectively form a cone, and wherein said deflecting step comprises:

positioning a deflector within at least part of the cone.

26. (Original) The method of claim 25, wherein the deflector is connected to the shroud interior and is one of a baffle, plate, or screen.

27. (Original) The method of claim 1, wherein the air stream emanates from an inlet located at the top of a cylindrical shroud and said deflecting step comprises:

directing the air stream with a diverter installed onto the inlet.

28. (Original) The method of claim 1, wherein said confining step comprises symmetrical isolation of the forming cavity so that the formed carrier possesses a consistent radius of curvature.

29. (Original) The method of claim 28, wherein symmetrical isolation comprises adjusting the geometry of the shroud so that the distance from the mold insert's periphery to the shroud is equal and symmetrical in all radial directions.

30. (Original) The method of claim 1, wherein following said deflecting step the method further comprises the steps of:

unclamping the platens; and

annealing the carrier at a temperature between 50 and 275 degrees F for between 5 and 15 minutes to relax internal stresses and provide better mold replication.